Memorandum on Enzyme Repression May 28th. 1960.

At present the most important issue to decide is the question of whether Inducer and Repressor affect the rate at which enzyme forming sites are produced or else the rate at which a given enzyme forming site produces the specific enzyme.

On the basis of the work of Jacob and his co-workers, we may assume that the repressor of β-galactosidase represses the formation of the permease and β-galactosidase in the same single event. If we now assume that the enzyme forming site is the chromosome itself, then it would be logical to further assume that β-galactosidase and the corresponding Permease are derived from a single Polypeptide chain which stretches across a number of cistrons. We may then explain on this basis that when the formation of β-galactosidase is repressed, the formation of the Permease is repressed also.

This hypothesis could be tested by the method that has been developed by Dintzes. We should then expect that if a radio-active amino-acid is added to the bacterial culture at zero time and shortly thereafter the culture is cooled to 0° centigrade the Permease would be radio-active but not the β-galactosidase.

According to the concept developed by Jacob, enzyme synthesis might, however, follow the following model: The genes specific for β-galactosidase and Permease synthesize a single ribonucleic-acid strand which subsequently breaks up into the parts which correspond to the different enzymes. Each such "part" locates in a ribosome. If this is the phenomenon involved then in the experiment à la Dintzes, we should not expect any difference in the radio-activity of β-galactosidase and Permease.

May 30th. 1960.

Memorandum on Enzyme Repression

by Leo Szilard

At this time it would seem important to carry out an experiment that has a fair chance to show whether the repressor controls the rate of ~~synthesis~~ formation of the enzyme forming sites, rather than the rate at which the enzyme forming site forms the enzyme. The purpose of this memorandum is to discuss such an experiment, which is based on an, as yet unpublished, method, developed by Howard Dintzis, for labelling proteins.

Dintzis finds that if cells synthesizing protein are exposed for a short period of time τ to a labelled amino-acid and then chilled, the protein may be non-uniformly labelled. Let us assume that the polypeptide chain of the protein is synthesized from one end, and the polypeptide does not come off the "enzyme forming site" unless the synthesis of the polypeptide chain has gone to completion. Then we may expect to find protein molecules which are labelled at one end of the polypeptide chain, but not at the other end, provided the time period τ is short compared to the time τ_o required for the synthesis of the complete polypeptide chain. Experiments, which Howard Dintzis performed on the synthesis of haemoglobin by reticulocytes, appear to indicate that such non-uniform labelling is obtainable.

The method employed by Dintzis should make it possible to determine τ_o, the time required for the synthesis of an enzyme molecule in bacteria. All one has to do is to increase the time period τ and to determine in what manner non-uniform labelling of the enzyme molecule disappears with increasing values of τ.; from this one may compute the time τ_o required for the synthesis of the enzyme molecule.

If an enzyme, that has a molecular weight of 100,000, amounts, in the absence of repression, to 5% of the protein content of a bacterium, like E.Coli, and if the enzyme is synthesized by a single enzyme forming site, this would mean that the

time τ_o required for the synthesis of an enzyme molecule, may be somewhere between 1/20th and 1/10th of a second. If one now determines experimentally, by means of the method developed by Dintzis, the time required for the synthesis of the enzyme molecule and if one should find this time to be of the order of, say, 10 seconds, then one would conclude that the number of enzyme forming sites must be somewhere between 100 and 200. Accordingly one would then be able to say that the rate of formation of the enzyme forming sites must be very high in the absence of repression.

The argument is not reversible, however. If the time τ_o determined by the experiment should come out to be between 1/20th and 1/10th of a second, this would not allow us to conclude that the repressor does <u>not</u> control the rate at which enzyme forming sites are produced. Clearly, the enzyme forming sites could still be produced at a high rate in the absence of repression, but these sites would have to be short-lived. Thus, the number of enzyme forming sites present at any given time, could still come out to be very low and the rate at which a given site produces enzyme molecules would be correspondingly high.

ROUGH DRAFT August 26, 1960.

Memorandum on the Inheritance of Physiognomy

by Leo Szilard

I have the impression that, within one family, some of the children may strikingly resemble the father, other children may strikingly resemble the mother and still other children may strikingly resemble neither parent. For a boy to be the "spitting image" of his father or for a girl to be the "spitting image" of her mother does not seem to be a rare occurrence, and a striking resemblance between son and mother or daughter and father is seemingly encountered about equally often. Also, a boy or girl who does not strikingly resemble either parent seems to have an appreciable probability of striking resembling a grandparent, an aunt or an uncle.

On the basis of such impressions I am tempted to hazard a guess that in a population such as, for instance, the well-to-do people in England, the fraction of persons bearing a striking resemblance to one of the two parents might be somewhere between 5% and 25%.

In the absence of any objective data in regard to these matters we must regard the above listed impressions as "surmises", which would have to be verified on the basis of "objective" data in order to become established facts.

Such a verification might be obtained by assembling photographs of a sufficiently large number of families, i.e. parents and their children and also fathers, mothers, brothers and sisters of the parents of the children. Observers, who are unaware of the family relationships, may then try to pick out the pictures which strongly resemble each other. If the sample of families is large enough and if the pictures picked out by the observers, as resembling one another, turn out in every case to be the pictures of relatives then we may be satisfied that the observers did not base their selection of resembling pictures on some single striking feature

such as, for instance, a large or odd-shaped nose, etc. .

I shall in the following assume, for the sake of argument, that the "surmises" formulated above are going to be borne out by observations of the kind indicated above. If we then further assume, as we probably must, that the physiognomy of an individual is not determined by a single gene but rather by a fairly large number of genes, then the surmises stated above pose a thorny problem and it is not immediately evident how they may be explained on the basis of Mendelian Genetics. The purpose of this memorandum is to attempt to present such an explanation.

I shall assume that the physiognomy of an individual is determined by m pairs of homologous genes which I shall designate as the "physiognomy genes". Further I shall assume that each one of the 2m physiognomy genes produces its product in a "quantity" which is independent of all the other physiognomy genes. Finally, I shall assume that the physiognomy of the individual is determined by the ratio of "quantities" of the m, essentially different, gene products (which are produced by the m pairs of homologous "physiognomy genes"). For our purposes here the "quantity" of the gene product is represented not the weight but by the biochemical activity of the amount of the gene product, present in the cells.

We may then explain the above-stated "surmises" on the basis of the following postulates:

(a) The "physiognomy genes" are all located on one chromosome which we shall designate as the "physiognomy chromosome" and these genes are only infrequently separated from each other by crossing over between two homologous "physiognomy chromosomes".

(b) The "physiognomy chromosomes" fall into two sharply distinguishable classes: the strong "physiognomy chromosomes" and the weak "physiognomy chromosomes". The alleles of the m "physiognomy genes" carried by a strong physiognomy chromosome produce their gene products in large quantities, while the

alleles of the physiognomy genes carried by a weak physiognomy chromosome produce their gene products in small quantities.

The quantity of a gene product present in a cell may be assumed to be the sum of the quantities which the corresponding two homologous "physiognomy genes" would each, alone, maintain in the cell. Therefore it follows from postulate (b) that if the individual carries one weak and one strong "physiognomy chromosome" then the ratio of the quantities of the m different gene products is essentially determined by the strong physiognomy chromosome alone, and accordingly the strong physiognomy chromosome alone will then determine the physiognomy of the individual. The physiognomy of such an individual we may call a "pure" physiognomy.

We assume that the physiognomy of an individual who carries two strong or two weak chromosomes, ~~we assume that the physiognomy of that individual~~ is determined by both, rather than by one, of the two physiognomy chromosomes. The physiognomy of such an individual we may call a "mixed" physiognomy.

On the basis of our postulates we may say the following:

(1) If the father and the mother, each, carry a weak and a strong "physiognomy chromosome", then one quarter of the children will strikingly resemble the father, one quarter of the children will strikingly resemble the mother, and one half of the children will not resemble either parent.

(2) If one of the parents carries a weak and a strong "physiognomy chromosome" and the other parent carries two weak "physiognomy chromosomes", then half of the children will strikingly resemble one of the two parents and the other half will not strikingly resemble either parent.

(3) If one of the parents carries two strong "physiognomy chromosomes" and the other parent carries a weak and a strong

"physiognomy chromosome", then none of the children will markedly resemble either parent.

(4) If one of the parents carries two strong "physiognomy chromosomes" and the other parent carried two weak "physiognomy chromosomes", then none of the children will resemble either parent.

In the cases of (3) and (4), the children might bear a striking resemblance to an uncle, an aunt or a grandparent, even though they do not resemble either parent.

By making an objective study based on photographs of the members of a sufficient large ~~number~~ sample of families - the kind of study I have indicated above - it should be possible to determine for a given population the ~~frequencies~~ frequencies of the strong and the weak "physiognomy chromosomes" (which should of course add up to one). These frequencies could be determined for instance by finding what fraction of the children bears a strong resemblance to one of the parents. They could be determined also by finding what fraction of the children, who do not resemble either parent, bear a striking resemblance to, say, a grandparent. Both methods of determination ought to lead to the same value for the frequencies and the use of both methods provides a test for the internal consistency of the theory.

It is easy to see that if in a population the strong physiognomy chromosome and the weak physiognomy chromosome have both ~~a~~ the frequency of 50%, then (in that population) 25% of the children must bear a striking resemblance to one, or the other, of the parents. If the frequency of (either the strong or the weak) physiognomy chromosomes is less than 50%, then ~~a~~ the fraction of the children who bear a striking resemblance to one, or the other, of the ~~two~~ parents is less than 25%.

We may
~~One can~~ explain on the basis of mutation and selection why our postulates might hold true for some populations and also why the frequency of the strong and the weak physiognomy chromosomes might be about equal. In order to see this, let us assume that in a population there are present a great number of different pure physiognomies and that each of these is attractive to an appreciable fraction of the population, ~~and~~ let us further assume that the mixed physiognomies are less attractive than the pure physiognomies. If an aesthetic selection operates in the choice of a mate and if the individuals whose physiognomy is pure, and therefore "attractive", are more likely to procreate than those whose physiognomy is mixed and therefore less attractive, then the selection pressure would tend to maintain the strong physiognomy chromosomes. The same selection pressure ~~It~~ would also tend to maintain the frequency of the weak physiognomy chromosomes at about 50%, because the persons who have a pure physiognomy carry one strong and one weak physiognomy chromosome.

RESTRICTED

Memorandum

September 8, 1960.

To: Whom it does concern

From: Leo Szilard

Attached is a letter dated June 27, 1960, addressed to N.S. Khrushchev, Chairman of the Council of Ministers of the USSR, and an unofficial translation of his reply dated August 30, 1960, supplied to me by the Russian Embassy in Washington.

In the following I wish to sketch briefly the purposes for which my letter was written, the importance of the issue raised in it and the circumstances under which this letter was written and delivered:

(1) As time goes on it becomes more and more important that the Governments of Russia and America somehow reach a meeting of the minds on what it would take to avoid a war which neither of them want. Moreover, as time goes on, at some point it might become necessary for them to enter into formal agreements, covering some of the issues involved.

I am convinced that informal discussions between American and Russian scientists, conducted as a continuous operation, could greatly accelerate the reaching of a meeting of the minds on an inter-governmental level. If it becomes necessary for the Governments to enter into formal agreements, then such informal discussions would make it possible to detect what approach would offer a fair chance of reaching a workable agreement on the issues that have become negotiable.

In recent years most of the scientists who were acting in a policy advisory role to the U.S. Government recommended that the Government negotiate with Russia on the prevention of a surprise attack, as well as on the cessation of bomb tests.

I believe that if my American colleagues had had an opportunity to discuss these issues informally with their Russian colleagues at an early date, they would have realised that the prospect of successfully negotiating on these issues were not good.

(2) The so-called Pugwash meetings have afforded and they may afford in the future,

some opportunity for American scientists to have informal discussions with their Russian colleagues but these meetings are not adequate for our purposes. This point was taken up with Academician Topchiev, General Secretary of the Academy of Sciences of the USSR, at the second Pugwash meeting. As soon as we raised it he fully understood what type of discussions we had in mind and the importance which such discussions could have. He could not then say, however, how his Government would respond to the idea.

I cannot be certain of this and it is merely an "informed guess" on my part that, when Topchiev returned to Moscow, our proposal was at first rather favorably received and that later on it was not regarded quite as favorably. At the time of the Baden meeting in June of last year, I gained the impression that the change was not in the attitude of our colleagues of the Academy of Sciences of the USSR, but in the attitude of their Government.

After the Baden meeting, two distinguished Americal colleagues who had previously told Academician Topchiev that they were interested in conversations with their Russian colleagues, formally expressed their interest in visiting scientific institutes in Russia and they were invited by the Academy of Sciences of the USSR to make such a visit. In response to this invitation they went to Russia early this year and upon their return they told me whom they had seen and what they had been able to discuss. Their report led me to conclude that Academician Topchiev did his best, but that the conversations which he arranged fell far short of the purposes which we have in mind, because they did not have the unqualified blessing of the Soviet Government.

(3) In these circumstances I thought that if further progress were to be made we would have to secure the blessing of the Russian Government at the highest level and I raised this issue with a Russian colleague who visited me. He offered to transmit a letter from me to Khrushchev and to transmit it directly, rather than through the Academy of Sciences of the USSR. I accepted his offer, but I asked him that he first show my letter to Topchiev and that he destroy my letter, rather than transmit it, if Topchiev felt that the letter was unnecessary. I first knew that my letter had in fact been transmitted to Khrushchev when I received his reply, which is enclosed.

(4) Subsequently, I received a letter from Academician Topchiev which proposed concrete measures for implementing the proposal of holding informal discussions between American and Russian scientists after the next Pugwash meeting in Moscow.

(5) A Pugwash meeting was scheduled to be held in Moscow on September 11 of this year, but this meeting has been postponed because a number of knowledgeable and influential American scientists who were invited to participate said that they would not want to attend a meeting in Moscow prior to the elections, but would go to Moscow after the elections. A new date for the Moscow meeting will be set at the meeting of the Steering Committee to be held in September in London.

The Moscow meeting would not be sponsored by Cyrus Eaton, nor did he sponsor the fourth Pugwash meeting which was held in Baden. Formal invitations to the next meeting would go out, as on earlier occasions, over the signature of Bertrand Russell, but the actual decision of who in America should be invited to the meeting rests with the American members of the so-called Continuing Committee. These are Harrison Brown, The California Institute of Technology; Bentley Glass, Johns Hopkins University, and Eugene Rabinowitch, University of Illinois.

(6) It is not my function to make any arrangements with the Academy of Sciences of the USSR. I am therefore transmitting copies of my correspondence with Khrushchev and Topchiev to Jerome Wiesner, The Electronics Research Laboratory, The Massachusetts Institute of Technology; to Richard Leghorn, President, Itek Corporation, Boston Mass.; to Harrison Brown, Professor of Geology, The California Institute of Technology, and to Paul Doty, Chemistry Department, Harvard University. All of them have in the past been in contact with the Academy of Sciences of the USSR on the subject of holding informal discussions between American and Russian scientists.

I am going to suggest that Wiesner, Leghorn and Doty assume responsibility for making direct arrangements with the Academy of Sciences of the USSR and that Harrison Brown act as liaison between them and the so-called Continuing Committee of the Pugwash Group.

(7) Khrushchev's letter indicates that the Soviet Government now understands, at its highest level, what kind of discussions we have been contemplating and in what way such conversations might be useful and important. We must now make a real effort to explain this to the U.S. Government also. Above all, the matter ought to be taken up with the President-elect soon after November 7.

What we need is a clear and enduring recognition on the part of the U.S. Government that we ought to have informal discussions with our Russian colleagues on a continuing basis and that such discussions must not be postponed, or interrupted, because there may be a setback in negotiations conducted at the governmental level or because governmental negotiations, on one issue or another, are in progress or appear to be imminent.

THE END

Memorandum

To: Harrison Brown
Paul Doty
Richard S. Leghorn
Jerome Wiesner

September 14, 1960.

From: Leo Szilard

Attached you will find an unofficial translation of a letter which I received from Academician Topchiev. I had this translation made in New York because no English translation was enclosed with the Russian text.

I am writing to propose that one of you take over, from here on, the contact with the Academy of Sciences of the USSR in this matter and that he keep the others currently informed of what is being done.

I should be grateful to you if you would consult with each other and then inform me who in particular will henceforth deal in this matter with the Academy of Sciences of the USSR, and I shall then accordingly inform Academician Topchiev.

Please advise me at Room 812, The Memorial Hospital, 444 East 68th Street, New York 21, N.Y. You may reach me there over the telephone from 8 a.m. to 5 p.m. at extension 133, TRafalgar 9-3000.

Leo Szilard

Attachment

Memorandum

To: Harrison Brown
Paul Doty
Richard S. Leghorn
Jerome Wiesner

September 19, 1960.

From: Leo Szilard

Recently I had a very satisfactory conversation with Mr. William C. Foster, who came to see me at the request of Vice President Nixon. Since that time I have received a letter from him, a copy of which I am enclosing for your information.

I have advised Mr. Foster that one of you is going to assume the responsibility for making concrete arrangements with the Academy of Sciences of the USSR, and I wrote him that I will let him know who it will be, when I know it.

Leo Szilard

Enclosure

OLIN MATHIESON CHEMICAL CORPORATION

1000 CONNECTICUT AVENUE, N. W.
WASHINGTON 6, D. C.

WILLIAM C. FOSTER
VICE PRESIDENT
PUBLIC AFFAIRS

September 16, 1960

Dear Professor Szilard:

It was a great pleasure to have an opportunity to talk with you last week about your activities in connection with promoting a meeting of top Russian and American scientists.

I also appreciate your making available to me the correspondence between yourself and Chairman Khrushchev, the excerpts from your forthcoming book and your memo on the background of the Khrushchev correspondence.

I have reported, as I indicated I would, to Vice President Nixon indicating my own belief that conferences such as you have been suggesting can be useful in making progress toward an understanding between us and the Soviet scientists at least and hopefully, beyond that if it develops properly.

I have suggested that this would depend on the wise selection of the small group of American scientists who would meet in the informal discussions following the larger Pug Wash Conference such as is presently scheduled for November 27th.

No doubt the briefing of the lucid documents which you sent me has meant the loss of some of the spirit you put into them but in the interest of the Vice President's time I thought the key points should first be made and I will hope for the opportunity of developing them in more detail later.

I commend you for your continued interest and hope that something may come out of this activity of real value to the national interest.

With best wishes to you, I am

Sincerely yours,

Professor Leo Szilard
Memorial Hospital
New York City

ОЛИН МЭТИСОН КЕМИКЭЛ КОРПОРЭЙШЕН

1000 Коннетикут Авеню, Н.В.
Вашингтон 6, Д.К.

Уиллиам Фостер
Вице-президент

16 сентября 1960 г.

Дорогой профессор Сцилард,

Я имел большое удовольствие беседовать с Вами на прошлой неделе на тему о Вашей деятельности, посвященной проекту созыва конференции выдающихся русских и американских ученых.

Благодарю Вас за ознакомление меня с Вашей перепиской с председателем Хрущевым, с выдержками из Вашей следующей книги и с меморандумом о причинах переписки с Хрущевым.

Как я Вам обещал, я доложил об этом вице-президенту Никсону и подчеркнул свое убеждение, что конференция, созвать которую Вы предлагаете, может оказаться полезной на пути прогресса к взаимопониманию между нами и советскими учеными и может, будем надеяться, дать еще более благоприятные результаты.

Я подчеркнул, что это будет зависеть от умелого подбора небольшой группы американских ученых, которые примут участие в неофициальном обсуждении после крупной конференции Пог Вош, намеченной теперь на 27 ноября.

При просмотре пересланных Вами мне документов, ярких по содержанию, я обратил внимание на потерю ими некоторой доли энтузиазма. Принимая во внимание перегруженность вице-президента я ограничился ознакомлением его только с основными пунктами и надеюсь, что позже представится возможность остановиться на них подробнее.

Я приветствую Вас за проявляемый Вами интерес и надеюсь, что деятельность Ваша даст результаты, которые пойдут на пользу нашим национальным интересам.

С наилучшими пожеланиями, остаюсь

искренно Ваш

Профессору Лео Сциларду
Госпиталь Мемориал
Город Нью Йорк

MEMORANDUM OF OCTOBER 21, 1960

By Leo Szilard

(1) Only by excluding war between the Great Powers can we solve the problem posed by the bomb because any war in which America and Russia intervened on the opposite sides might turn into an atomic war. This would hold true even if the Great Powers were to try to turn the clock back and attempt to rely for their defence on conventional weapons only, for the world may get rid of the bombs which have been stockpiled but it cannot get rid of the knowledge of how to make the bomb.

(2) In order to exclude war between the Great Powers, it will be necessary to have general and virtually complete disarmament. Such disarmament does not, however, automatically guarantee peace. Even in a world virtually completely disarmed, armies equipped with machine guns could spring up, so to speak, overnight. Neither Russia nor America could be successfully invaded by such improvised armies and these nations would be militarily secure in such a disarmed world, but many of the smaller nations would have no such security.

In a disarmed world, America and Russia would still be strong enough to extend military protection to their neighbours, but they would not be in the position to extend such military protection to nations which are geographically remote from their own territory. The situation would be in this respect quite similar to what it was before the development of modern weapons.

After the second world war, America extended her military sphere of influence to geographically remote areas. In doing so, she was guided to a great extent by strategic considerations. These strategic considerations are now in the process of becoming obsolete, but the fact remains that America is at present morally committed to the defence of nations which are geographically remote from

the American continent, such as, say, South Korea. The same holds true to a lesser extent also for Russia, which is just now taking the first faltering steps towards assuming responsibility for the military security of nations that are geographically remote from her own territory such as, for example, Cuba. To what extent Russia and America would, in fact, be able to protect areas which are geographically remote from their own territory, while the so-called atomic stalemate is still maintained, is far from being clear.

(3) While it is not clear at this time whether in the atomic stalemate America and Russia would be able to live up to their commitments to protect nations geographically remote from their own territory, it is perfectly clear that they certainly would not be able to extend such protection if there is general and virtually complete disarmament. Therefore, the Great Powers may be reluctant to embrace general disarmament unless they can somehow free themselves from their commitments to protect the smaller nations in the disturbed areas of the world. Presumably they could free themselves from these commitments if it were made possible for them to shift responsibility to some international police force operating under UN auspices.

A world police force operating under the central command of the Secretary General of the UN would not be acceptable to Russia in the circumstances which prevail today, and it might hot be acceptable to the United States under the circumstances which might prevail a few years hence.

It would be necessary for America and Russia soon to reach a meeting of the minds on an acceptable set-up under which international police forces ~~ax~~ could operate under UN auspices.

(4) I personally believe that it might be a mistake to think in terms of setting up a world police force operating under a central command, and that we ought to think instead in terms of a separate regional police force in each of the

disturbed areas of the world. Each of these regional forces could be under the control of a group of, say, five nations (a different group for each region, not necessarily members of the region) who would appoint the Commander in Chief. All these regional forces would operate under the auspices of the UN, and the different groups of the nations who shall assume responsibility for the regional police forces in the different regions would be set up with the approval of the Security Council, with the concurrence of the five permanent members of the Security Council.

Before such a scheme could be put into operation, it would be necessary for the Great Powers to reach an agreement with each other on the "disturbed regions" where a regional police force might have to be set up within the predictable future. They also would have to reach an agreement on the group of nations who would assume responsibility for each such region. This would require negotiations with a certain amount of give-and-take, and the final outcome of the negotiations would obviously represent a compromise.

There would be little point in agreeing on the scheme in principle unless there is agreement reached on the groups also. An agreement on the groups would in a sense represent a political settlement. Because a group can be set up only with the concurrence of all the Great Powers, a region in which such a police force operates might become a sphere of influence of one or the other of the Great Powers.

It would be very undesirable to have a regional police force ever wage a war against a nation of the region as a whole. Therefore the regional forces would have to be police forces rather than armies, and would have to have the right as well as the power to arrest individual members of the government of a nation that endangers the security of another nation within the region. Thus a regional police force would be capable of intervening in the internal affairs of nations, even though they would not be supposed to do so. This danger could be minimised by initially setting up most of the regional forces on paper only. A police force need not be actually set up in any given region until the group of nations in charge of the regional police force on paper believe that there is a real danger of a major disturbance and

are therefore wi lling to assume a certain portion of the financial burden connected with the maintenance of the police force in the region.

(5) General and virtually complete disarmament will become acceptable to the Great Powers only if there are satisfactory safeguards so that any major violation of the disarmament agreement will be promptly discovered. Such safeguards would have to include rather far-reaching measures of inspection. Such measures of inspection would be acceptable to Russia at the time when the first major step towards disarmament is taken only if this step goes far enough to make it possible for Russia to relinquish the strategic advantages which xx she is at present deriving from secrecy.

The required measures of inspection are not likely to consist in having a vast number of foreign inspectors roam about in American and Russian territory. If disarmament goes far enough, then ~~xxxxxxxx~~ neither America nor Russia would have any reason to limit the number of foreign inspectors operating on their territory but the admission of such foreign inspectors, even in practically unlimited numbers, would still not offer real assurance that bombs and rockets might not be hidden in substantial numbers. If the Russian or the American Government wanted to hide bombs and rockets, as long as the government had the wholehearted co-operation of the scientists and engineers in such an ~~d~~ endeavour, there would be no assurance that foreign inspectors would be able to discover the illicitly retained bombs and rockets. It should be possible, however, for Russia and America to create conditions in which Russia could be certain that secret violations of the disarmament agreement occurring on American territory would be reported by American citizens to some international control commission, and America could be certain that secret violations occurring on Russian territory would be reported by Soviet citizens to such a control commission.

means what?

I believe it is now necessary for Russia and America to reach a meeting of the minds on what the nature of a first major step towards disarmament would have to be, and just how far such a first step would have to go in order to make it possible for Russia as well as America to create conditions in which it would be possible to set up satisfactory safeguards against any major secret violation of the agreement.

(6) I personally believe that the first major step towards disarmament could leave both Russia and America in possession of a limited number of legimately retained large bombs and means suitable for their delivery, if the following conditions can be met :-

(a) The far-reaching measures of inspection which would go into operation at the time when the first major step towards disarmament is taken must not create a situation in which a sudden American attack by means of the legitimately retained large bombs could destroy Russia's ability to strike a counterblow by means of her legitimately retained large bombs, or vice versa.

(b) At the time when far-reaching measures of inspection come into effect, the armed forces of both America and Russia shall be organized to be adapted for conventional warfare only, and it shall be the policy of both America and Russia not to resort to the use of atomic bombs except if they or their allies are attacked by atomic bombs.

Small atomic bombs suitable for use against tropps in combat shall be eliminated and all equipment suitable for the delivery of such bombs shall be destroyed.

In accordance with this policy, the nations involved shall each unilaterally pledge not to use atomic bombs except if they are attacked by atomic bombs.

The legitimate retention of a limited number of large bombs and means suitable for their delivery would have the advantage of minimising the importance

of bombs and rockets which might be secretly retained with or without the connivance of the government.

The condition listed under (a) might not be easy to meet, and might demand a considerable reorganization of the present Russian as well as American defence set-up. Thus it would not be possible, for instance, to meet condition (a) if Russia were to rely for her defence on a comparatively small number of stationary and "soft" bases for the launching of her long range rockets, and if she were able to keep the location of most or all of these bases unknown. In such a situation, no far-reaching measures of inspection would be acceptable to Russia.

Informal discussions between Americans and Russians who are concerned with the problems of disarmament might go a long way towards elucidating the difficulties which must be overcome in order to make the required measures of inspection acceptable to Russia at the time when the first major step towards disarmament is taken.

(7) Real progress towards disarmament will be made only if there is a meeting of the minds between the American and Russian governments on an acceptable set-up under which UN police forces might operate and on the first major step towards disarmament which will make far-reaching measures of inspection acceptable. If there is a meeting of the minds on these two points, then it will be possible to draft a disarmament agreement which would lead step by step to general and virtually complete disarmament, and to have assurance that, once the disarmament agreement is accepted, the Great Powers will be willing to go through all the way to virtually complete disarmament, providing the conditions envisaged are actually maintained. (especially concerning China)

Since at this moment it is impossible to know how long it will take for America and Russia to reach a meeting of the minds on the two issues stated above, it is impossible to know how long we are going to have to live with the bomb.

As long as the stalemate is maintained, America and Russia will be able to destroy each other to any desired degree, and therefore the threat of a massive

attack made by America against Russia, or vice-versa, would be tantamount to a threat of murder and suicide. Such a threat might be believable, and therefore effective, in a conflict where the nation's very existence is at stake, but it would not be believable, and would therefore be ineffective, in a conflict in which some important national interest might be at stake, but not the very existence of the nation. Therefore, it will not be possible for America and Russia to protect nations remote from their own territory by threatening murder and suicide.

At the present time, to the extent that America relies on the bomb for the defence of nations in geographically remote locations, she relies on small bombs which can be used against troops in combat rather than on large bombs (which could be used to demolish strategic objectives, destroy a city and at the same time render its surrounding territory uninhabitable by spreading radio-active dust, and which also could be used to demolish a city which has been evacuated after due warning without spreading any appreciable amount of radio-activity).

actual situation much more complex

Many people in America believe that the large bombs are only good for threatening murder and suicide, and could be used by either America or Russia only for purposes of retaliation in case one were attacked by the other with such bombs. At present, it is more or less a tenet of faith in America that even though it may not be certain that, if atomic bombs were used against troops in combat within the area of the actual conflict, such a war would not spread into an all-out atomic catastrophe, it is quite possible that such a war could be kept limited. It is part of the same tenet of faith that it would be impossible for any nation to lean on the large bombs rather than the small bombs, without necessarily threatening or risking murder and suicide.

It appears to be a fact that Russia, on the other hand, is not thinking in terms of using small atomic bombs against troops in combat and is leaning for her defence on the large bombs rather than the small bombs. It is not clear whether, in leaning on the large bombs, Russia is threatening murder and suicide, or whether she thinks it is possible to resort to use of the large bombs and yet limit the

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Krushchev speech of last January did not sound this way. Also, they have tested small bombs,

destruction that will ensue.

My own view may be summarised as follows :-

(a) It is possible but by no means certain that a nation might resort to the use of small bombs against troops in combat within the limited area of conflict and succeed in ~~kmpx~~ keeping the war limited.

(b) It is possible but by no means certain that a nation might resort to the use of large bombs for the purpose of demolishing (possibly ~~an~~ evacuated) city and succeed in keeping the amount of destruction suffered by both sides limited.

(c) If, in a conflict between two nations, one leans on the small bombs whereas the other leans on the large bombs, then the large bombs wi ll prevail.

It is even conceivable that if the Great Powers understood the nature of the stalemate and decided to lean on the large bombs rather than the small bombs, the threat of force might take on a new form in the so-called stalemate and would cease to mean the threat of war. I have described how this might happen in "The Voice of the Dolphins" (to be published in book form by Simon and Schuster in 1961), which relates the history of the world from 1960 to 1985. The sequence of historical events related in this book does not represent the most likely course of events - rather I have chosen a particular sequence of events in order to demonstrate what it might take in the atomic stalemate to avoid a war neither America nor Russia wants.

In this book I ~~mx~~ show how, for a period of time, the so-called atomic stalemate becomes stable and the threat of war virtually disappears. But the stalemate does not remain stable for long. The character of the stalemate changes and, when a number of nations begin to rely on submarines capable of launching rockets, the security of the Great Powers is seriously threatened. When that happens, there arises an irresistible desire for general and virtually complete disarmament.

Not long ago, Russia threatened to use long range rockets against America if America were to attack Cuba. Even though I personally would take this threat more seriously if it were made two years hence, I would want to analyze what a threat of this type might mean. Since nothing that may happen in Cuba threatens Russia's internal security, and certainly in a conflict between the United States and Cuba, Russia's national existence would not be at stake, Russia could not make a threat of murder and suicide in such a conflict and expect it to be believed. Naturally, the threat might have been made in the belief that America would not intervene militarily in Cuba but, even though such an intervention may not appear likely, it is not possible to be certain about anything of this sort. Perhaps Russia made the threat of using large bombs and rockets in case of an attack against Cuba without making it clear whether this was a threat of murder and suicide or whether this was something else, in order to keep America guessing - just as, in the past, America made threats for the purpose of keeping the "enemy" guessing.

It is my contention, however, that in the atomic stalemate, it is dangerous for America and Russia to keep each other guessing. It seems to me that, if we have to live with the bomb for several more years, America and Russia will have to arrive at an understanding of what it would take in the so-called stalemate to avoid an atomic war which neither of them wants. I believe that once both governments fully understand the nature of the stalemate, it should be possible for them to reach the kind of informal understanding that would be needed . In order to keep the atomic stalemate stable until such time as the first major step towards disarmament may be taken, we are going to need such informal understandings rather than any formal agreements.

(8) As long as we continue to live with the bomb, we must be seriously concerned about the possibility that an accidental or unauthorised attack by a local commander might lead to an all-out atomic war between America and Russia.

In the atomic stalemate, it is quite difficult to provide for safeguards against an unauthorised attack, as well as an accidental attack, and at the same time keep the bases from which the bombs are launched protected against attack. This will become even more difficult if America will increasingly rely for her defance on submarines capable of launching rockets.

As long as the atomic stalemate continues, it will be important that the President of the United States and the Chairman of the Soviet Union be able to reach each other in case of an emergency over the telephone without undue delay. No such telephone communications are available at present. not true

How an unauthorised attack by an American commanding officer might start such a war has been vividly described in an American book which has been apparently fairly widely read* ("Red Alert" by Peter Bryant, Ace Book No. D-350; Ace News Co., 43 West 47th Street, New York 36, New York). This book is, of course, fiction and moreover, being three years old, the quoted rules under which bombers were supposed to be launched are certainly not in operation today, if indeed they ever were in operation. But the book correctly describes what could happen under unusual circumstances.

The book describes how in an emergency, when it is believed that a Russian city will be hit by an American bomb, the President of the United States finds himself forced to offer to the Chairman of the Soviet Union that he wi ll tolerate the demolition of an evacuated American city "of equal size", as a retribution.

I believe that, if the atomic stalemate persists for several more years, it will be necessary for America and Russia to have an understanding of just what is meant by a "city of equal size", in case it becomes necessary to accept a retribution. Rmk Perhaps it would be simplest to reach an xmx understanding that

* by the "professionals" in this business.

the number of inhabitants determines the size of a city for such purposes. And perhaps there ought to be a list of all American and Russian cities on record which is accepted as authentic by both governments, and which gives the number of inhabitants for each city. Moreover, there ought to be an understanding that any city which is to be demolished with the authorisation of either government would be given adequate warning to permit its orderly evacuation.

I propose that, until such time as it is possible for the two governments to prepare an authorised list, the list of the cities attached to this memorandum which I have compiled from the best data available to me, serve in lieu of such authorised list.

Getting explicit, advance ~~agreement~~ understanding on this seems to me totally unlikely. It would require decision-makers to confront the possibility of war with a degree of seriousness that is just not likely to be realizable short of a very extreme crisis. It is much worse than the problem of getting a man to make a will.

Beyond this, I think it undesirable to promote limited-retaliation type doctrines. They are too dangerous. If military force must be used, it is both more desirable & more likely that it be conventional, not nuclear in any form. I am not basically sympathetic to discussions that serve to erode this fact.

MEMORANDUM NO. 2: 31st OCTOBER 1960

General and virtually complete disarmament does not automatically guarantee peace. Even in a world virtually completely disarmed, armies equipped with machine guns could spring up, so to speak, overnight. Neither Russia nor America could be successfully invaded by such improvised armies, and these nations would be militarily secure in such a disarmed world. But many of the smaller nations, particularly those located in certain disturbed areas of the world, would have no such security. Even in a disarmed world, America and Russia would be still strong enough to extend military protection to their neighbours, but they would not be in a position to extend such military protection to nations which are geographically remote from their own territory. After the second world war, America extended her military sphere of influence to ~~xxx~~ geographically remote areas. In doing so, she was guided to a great extent by strategic considerations.

In the next phase of the so-called atomic stalemate towards which we are rapidly moving at present, these strategic considerations will become obsolete. Moreover, it is far from being clear whether America would be able to protect areas which are geographically remote from her own territory, while the so-called atomic stalemate is still maintained. On the other hand, it is perfectly clear that America would not be able to extend such protection to geographically remote areas if there is general and virtually complete disarmament. Many ~~xxxxxxx~~ Americans will be reluctant to regard general and virtually complete disarmament as desirable unless they can see a way in which America could extricate herself from the moral and legal commitments to protect areas which are geographically remote from her territory, and do so without

suffering unacceptable losses in prestige. The security of Europe might pose no serious problem in the case of general and virtually complete disarmament because, if the heaviest mobile weapons in existence are machine guns and light tanks, then fortifications, even properly constructed trenches, would offer either Eastern Europe or Western Europe adequate protection from each other in case of an attack by an improvised army equipped with machine guns and light tanks. But, in order to free herself from the commitment to protect the smaller nations in the disturbed areas of the world, America might want to shift the responsibility for their protection to some international police force operating under UN auspices. A world police force operating under the central command of the Secretary General of the UN would not be acceptable to Russia in the circumstances which prevail today, and it might not be acceptable to the UnitedStates under the circumstances which might prevail a few years hence. If America and Russia were to reach a meeting of the minds on an acceptable set-up under which international police forces could operate under UN auspices, this would remove one of the two major road blocks on the path to disarmament. I personally believe that, as long as we think in terms of a centrally controlled world police force operated by the Secretariat of the UN, it will not be possible to devise a set up which is acceptable to both America and Russia. I believe that we ought to think instead in terms of a number of regional police forces, a different force in each of the disturbed areas of the world, which would be set up with the approval of the UN Security Council with the concurring vote of the five permament members, but would not be operated by the Secretariat of the UN. One way in which this could be accomplished is described in Appendix I.

MEMORANDUM NO. 2 (SECOND VERSION)

Up to very recently, there was very little interest in America in disarmament. Two years ago, when a group centering around MIT and Harvard wanted to set up a summer study devoted to this problem, they were not able to get the necessary funds either from the Ford Foundation or the Rockefeller Foundation. It is perhaps a sign of the times that ~~they were~~ this year they were able to get the required funds from a third foundation, and that they were able to set up such a study.

A few years ago, when it appeared possible that a Summit Meeting might be held in 1959 or 1960, I was asked at one of the Pugwash meetings by a Russian colleague whether the scientists in America might not exert influence in favour of holding such a Summit Meeti g. I told him at that time that pressure of world opinion more than anything else could force the American Government to go into a Summit Meeting but that - as they say in America - you can lead a horse to the water but you cannot make him drink. The American Government can be forced to sit down and negotiate with Russia on disarmament but such a negotiation cannot possibly lead to a workable agreement as long as most influential Americans in and out of Congress find general and complete disarmament unacceptable. Therefore, it is necessary for us to discuss the question of what are the real reasons behind the reluctance of influential Americans to accept disarmament, and what it would take to eliminate ~~$~~ these reasons.

The argument that ~~xxx~~ is most often advanced in America against disarmament is that Russia would not agree to set up satisfactory safeguards, even if far-reaching disarmament were ~~xxxxxxx~~ agreed upon. I am convinced, however, that many influential Americans would oppose

general and complete disarmament even if they could be satisfied that the Soviet Union w uld offer adequate safeguards against secret violations of the agrement. Many of these people would be opposed without perhaps even knowing why they were opposed. In the post-waree years, America adopted the role of being the protector of a number of nations located in geographically remote areas, and America would have to abandon this role in a generally and virtually completely disarmed world. Many Americans would be reluctant to see America give up this role until America can extricate herself from her moral and legal commitments to protect such remote areas and can do so without loss of prestige.

We must at this point try to visualise what kind of a world we would have in case of general and virtually complete disarmament. Such disarmament does not automatically guarantee peace. Even in a world virtually completely disarmed, armies equipped with machine guns could spring up, so to speak, overnight. Neither Russia nor America could be successfully invaded by such improvised armies and these two nations would be militarily secure in such a disarmed world. Moreover, even in a disarmed world, America and Russia would be still strong enough to extend military protection to their neighbours.